CANDIDATE SURFACE WATER BENCHMARKS FOR DERIVATION OF GW-3 STANDARDS

MCP Category GW-3 Standards (310 CMR 40.0974(2) apply in all groundwater areas for a Method 1 risk characterization. These standards are intended to provide some protection against the migration and eventual discharge of groundwater contaminants to surface water at concentrations above an Ambient Water Quality Criterion. A dilution/attenuation factor of 10 is applied to allowable surface water concentrations to identify allowable groundwater concentrations.

The previously promulgated GW-3 standards for listed OHM were based on the lowest environmentally based EPA Ambient Water Quality Criteria (from among the Fresh Water Acute, Fresh Water Chronic, Marine Acute, and Marine Chronic), which were modified as described in section 4.3.1 of *Background Documentation for the Development of the MCP Numerical Standards* (DEP, (1994). If a criterion was not available, the Lowest Observed Effect Level (LOEL) available in the EPA criteria documents was selected as the allowable surface water concentration for derivation of the GW-3 standard.

The purpose of this memorandum is to provide a list of candidate surface water benchmark concentrations for use in revising the GW-3 standards, and to describe the basis for each of the candidate benchmarks.

DEP solicits input concerning several new issues proposed for use in revising the GW-3 standards. Notably, these include inclusion of new chemicals, use of the National Ambient Water Quality Criterion for fish consumption as well ecological effects, the use of an Acute to Chronic Ratio (ACR) =10 for chemicals that have only acute toxicity data, and the use of lowest chronic values from the AQUIRE database, Oak Ridge National Laboratory publications, and Tier II values.

Candidate Ecological Surface Water Benchmarks

The candidate benchmark concentrations are provided in the attached table and described below:

National Ambient Water Quality Criteria (NAWQC)

The values in these columns are the current EPA (1999) Criterion Maximum Concentrations (CMC) and Criterion Continuous Concentrations (CCC), representing acute and chronic exposures, respectively for freshwater and saltwater. The criteria of some metals vary with water hardness, which is assumed to be 20 mg/L for purposes of deriving GW-3 standards. Some chemicals had CMC values, but no CCC value. For these chemicals the CCC was estimated by dividing the lowest CMC by 10.

AQUIRE Lowest Toxicity Value

The lowest acute and chronic toxicity values for freshwater organisms from toxicity tests reported in published and unpublished reports were obtained from the EPA AQUIRE database (http://epa.gov/ecotox/). Only studies with complete documentation were included in selection of lowest values. The values represent a variety of effect endpoints, including LOEC (Lowest Observed Effect Concentration), MATC (Maximum Acceptable Toxicant Concentration), LC50 (Median Lethal Concentration), EC50 (Median Effect Concentration). AQUIRE chronic values were not available for some chemicals that had AQUIRE acute values. For these chemicals, the AQUIRE lowest chronic was estimated by dividing the AQUIRE lowest acute value by 10.

Lowest Chronic Values

Most of the lowest chronic values were from Suter and Tsao (1996). This value is the lowest measured or estimated chronic value among fish, daphnids, non-daphnid invertebrates, and aquatic plants from Suter and Tsao (1996). The measured chronic value was obtained from chronic toxicity tests reported in the scientific literature. Some of the lowest chronic values were

extrapolated from 96-hour LC50s (for fish) or 48-hour EC50s (for daphnids) using regression equations. The values from Suter and Tsao (1996) are less current than those obtained from more recent AQUIRE searches.

Tier II Chronic Values

Suter and Tsao (1996) from Oak Ridge National Laboratory (ORNL) listed acute and chronic Tier II values that were calculated by EPA or calculated by ORNL according to methodology similar to *EPA's Proposed Water Quality Guidance for the Great Lakes System* (EPA, 1993) using the scientific literature. Tier II values were developed so that aquatic benchmarks could be established with fewer data than are required for the NAWQC. According to Suter and Tsao (1996), the Tier II values are concentrations that would be expected to be higher than NAWQC in no more than 20% of cases . Tier II values for ethylene dibromide and methyl tertiary butyl ether (MTBE) were obtained from more recent unpublished literature. Some of the Tier II values were obtained from EPA (1996) if they had originally been calculated by EPA, rather than ORNL.

Proposed process for selection of surface water benchmark

The surface water benchmark for derivation of GW-3 standards is selected according to the following order of preference:

1) Select the lowest freshwater or saltwater Criterion Continuous Concentration as ecological benchmark.
2) If a CCC is unavailable, select lowest CMC for freshwater or saltwater divided by 10 as the ecological benchmark.
3) If all the above are unavailable, select AQUIRE lowest chronic value as the ecological benchmark.
4) If AQUIRE lowest chronic is unavailable, select AQUIRE lowest acute value divided by 10 as the ecological benchmark.
5) If all the above are unavailable, select the lowest chronic value from Suter or Tsao (1996) or others as the ecological benchmark.
6) If all the above are unavailable, select the lowest chronic Tier II value from Suter and Tsao (1996) or others as the ecological benchmark.
7) Select the surface water benchmark as the lower of the selected ecological benchmark or the NAWQC for fish consumption by humans.

ACRONYMS

NAWQC	National Ambient Water Quality Criteria
LOEL	Lowest Observed Effect Level
LOEC	Lowest Observed Effect Concentration
CMC	Criteria Maximum Concentration
CCC	Criteria Continuous Concentration
FCV	Final Chronic Value
LC50	Median Lethal Concentration
EC50	Median Effective Concentration
MATC	Maximum Acceptable Toxicant Concentration

REFERENCES

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